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PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	§	Group Art Unit: 2183
Browning et al.	§	Examiner: Treat, W.
	§	Atty. Dkt. No.: 5181-11402
Serial No. 09/159,509	§	
Filed: September 23, 1998	§	
For: METHOD AND APPARATUS FOR CREATING A WIREFRAME AND POLYGON VIRTUAL WORLD	§	

CERTIFICATE OF MAILING
37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231, on the date indicated below:

Robert C. Kowert
Name of Registered Representative

October 3, 2001
Date

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APPEAL BRIEF

Box AF
Commissioner for Patents
Washington D.C. 20231

Sir/Madam:

Further to the Notice of Appeal filed July 10, 2001, Appellants present this Appeal Brief. A Petition and fee for a One Month Extension of Time is submitted herewith to extend the time for submission of this brief to October 10, 2001. Appellants respectfully request that this appeal be considered by the Board of Patent Appeals and Interferences.

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I. REAL PARTY IN INTEREST

The subject patent and reissue application are owned by Sun Microsystems, Inc., a corporation organized and existing under and by virtue of the laws of the State of Delaware, and having its principal place of business at 901 San Antonio Road, Palo Alto, California 94303, as evidenced by the assignment recorded at Reel 9279, Frame 9723.

II. RELATED APPEALS AND INTERFERENCES

This appeal is related to the appeal of reissue application no. 09/217,595. Examiner Treat is the Examiner for both the present application and for application no. 09/217,595. Both applications involve similar interpretations of the recapture doctrine by Examiner Treat.

III. STATUS OF CLAIMS

Claims 47, 95 and 96 were previously cancelled. Claims 1-46, 48-94 and 97-108 are pending and are the subject of this appeal. A copy of claims 1-46, 48-94 and 97-108, as on appeal, is included in the Appendix hereto.

IV. STATUS OF AMENDMEMNTS

No amendments to the claims have been filed subsequent to the final rejection. The Appendix hereto reflects the current state of the claims.

V. SUMMARY OF THE INVENTION

The invention relates to virtual reality systems, and to a method and apparatus for creating a virtual world from a database containing a limited pictorial representation of objects. The method and apparatus allows ordering (selection and grouping) of the limited representations so that attributes may be added (such as color, texture, group

hierarchy, constraints of motion, etc.) to create objects suitable for rendering in a virtual world. *See*, specification col. 1, lines 9-12 and 30-47; Figs. 1 and 2.

The invention provides for receiving a database of limited pictorial representations of virtual objects. Objects or object components may then be selected from the database. *See*, specification col. 1, lines 30-40; col. 2, lines 10-60; Fig. 1. Selected objects or components may then be grouped into a three-dimensional grouped object to be rendered in the virtual world. The three-dimensional grouped object may be represented by a three-dimensional and rotatable wireframe object or a three-dimensional and rotatable sweep polygon. *See*, specification col. 3, lines 29-42; Figs. 1-3.

Attributes may be assigned to the object. For example, attributes such as object hierarchy, rotation origin, constraints of motion, color, texture, thickness, etc. may be assigned. *See*, specification col. 1, lines 40-43; col. 3, line 43 through col. 4, line 33; Figs. 1 and 2. One or more grouped objects may be coupled with real world data so that a virtual world may be rendered which looks and functions according to the assigned attributes and real world data, and the virtual world may be animated. *See*, specification col. 1, lines 43-47; col. 4, lines 34-57; Fig. 1.

VI. ISSUES

1. Are claims 1-9 barred from reissue for lack of a substantive error and thus a defective reissue declaration?
2. Do claims 10-46, 48-94 and 97-108 impermissibly recapture subject matter surrendered in the application for patent upon which the present reissue application is based?

VII. GROUPING OF CLAIMS

Claims 1-9 were collectively rejected for failure to state an error warranting reissue. Solely for the purposes of resolving issue 1 of this appeal, claims 1-9 stand or

fall together.

Claims 10-46, 48-94 and 97-108 each stand or fall separately because each claim must be separately analyzed to determine whether or not it is broader than the patent claims, whether or not it recaptures surrendered subject matter, and whether or not it has been materially narrowed in other respects to avoid the recapture rule.

VIII. ARGUMENT

1. Claims 1-9

Claims 1-9 correspond to claims 1-9 of the patent (5,559,995) for which reissue is sought. Appellants assert that the reissue declaration properly states errors by which the patentees claimed less than they had a right to claim in the original patent and that these errors arose without deceptive intent. As shown below, the new claims submitted to address these errors do not impermissibly recapture surrendered subject matter. Thus, the reissue declaration states errors properly correctable through reissue and claims 1-9 should be allowed.

2. Claims 10-46, 48-94 and 97-108

The Examiner rejected claims 10-46, 48-94 and 97-108 under 35 U.S.C. § 251 and the recapture rule. The Examiner's reasons for applying the recapture rule can be found on pp. 2-3 of the Office Action of November 21, 2001. In light of the following remarks, Appellants assert that the Examiner has failed to state a *prima facie* rejection for each claim and has incorrectly applied the recapture rule.

First, Appellants assert that the Examiner has failed to state a *prima facie* rejection for each claim according to the recapture rule. The Federal Circuit recently clarified that "application of the recapture rule is a three-step process." *Pannu v. Storz Instruments, Inc.*, No. 00-1482 (Fed. Cir. July 25, 2001). The first step is to "determine

whether and in what 'aspect' the reissue claims are broader than the patent claims." *Id.* "The second step is to determine whether the broader aspects of the reissue[] claim relate[] to surrendered subject matter." *Id.* Finally, it must be determined whether the reissue claims are materially narrower in other respects to avoid the recapture rule. *Id.* As stated in section 1412.02 of the MPEP, "the Examiner must first review each claim for the presence of broadening." MPEP § 1412.02 indicates that the recapture rule must be applied to each claim. However, in his rejection the Examiner referred only to claim 46. Furthermore, even in regard to claim 46 the Examiner failed to identify how each step of the recapture rule was met. The Examiner only made vague references to broadening and did not identify the specific broader aspects. Nor does the Examiner explain for each claim how any broader aspects relate to surrendered subject matter. Instead the Examiner merely makes a bald assertion that material limitations from claim 1 of the patent have been dropped in claim 46. Finally, the Examiner completely ignored the third step of the recapture rule by failing to analyze whether the reissue claims were materially narrowed so as to avoid the recapture rule.

The recapture rule must be applied separately to each individual claim, including the dependent claims. Appellants assert that since the Examiner has failed to clearly identify how each step of the recapture rule is satisfied for each claim, a *prima facie* rejection has not been established under the recapture rule for claims 10-46, 48-94 and 97-108. Appellants note that the independent claims vary from one another in scope. The broader aspects are not the same for each independent claim. Also, many of the dependent claims (e.g. claim 44) include further limitations including much of the same language found in claim 1 of the patent. Thus, even if a broader aspect of one claim is impermissible recapture, the same is not necessarily true for the other claims which may not have been broadened in the same way or may have other material limitations to avoid recapture. Moreover, even if one of the independent claims was impermissibly broadened in regard to a specific aspect, one or more of the dependent claim may include that aspect to avoid recapture. However, the Examiner has not provided any specific analysis of exactly what aspect has been impermissibly broadened in one or more claims and whether

or not <u>each</u> claim is so broadened. Thus, the Examiner has failed to state a proper rejection.

Second, Appellants assert that none of the claims impermissibly recapture surrendered subject matter. The prosecution history is examined to determine whether an applicant surrendered particular subject matter. *In re Clement*, 45 USPQ2d 1161, 1164 (Fed. Cir. 1997); *Mentor Corp. v. Coloplast, Inc.*, 27 USPQ2d 1521, 1524-25 (Fed. Cir. 1993); *Ball Corp. v. United States*, 221 USPQ 289, 294-95 (Fed. Cir. 1984). There must be clear evidence of surrender through admission that the scope of the surrendered claims was not in fact patentable. *Seattle Box Co. v. Industrial Crating & Packing, Inc.*, 221 USPQ 568, 574 (Fed. Cir. 1984). "In other words, a general 'boiler plate' sentence [that the limitations of a claim distinguish from the prior art] will not be sufficient to establish recapture." M.P.E.P. § 1412.02. Claim 1 of the original application was amended twice during the original prosecution. In the first amendment of September 15, 1995, claim 1 was amended as follows:

> 1. (Amended) An apparatus for creating a virtual world data base, comprising:
> receiving means for receiving a pictorial representation of <u>objects in</u> the virtual world; and
> grouping means, coupled to the receiving means, for grouping descriptions of the pictorial representation <u>of objects in the virtual world</u> into selected groups <u>of at least one of wireframe objects and polygon objects</u>.

Accompanying this first amendment, Applicants argued that the Wexelblat referenced was concerned with representations of data within an information system as opposed to virtual objects which are grouped into at least one of wireframe objects and polygon objects. *See* Amendment of September 15, 1995, pp. 5-6. In the Final Action of December 31, 1995, the Examiner maintained the rejection finding the amendment unpersuasive. Subsequently, on April 1, 1996, Applicants amended claim 1 a second time as follows:

> 1. (Twice Amended) An apparatus for creating a virtual world data base, comprising:
> receiving means for receiving [a pictorial representation] <u>first,</u>

second and third polygon representations of respective first second and third virtual objects in a [the] virtual world;

selecting means, coupled to said receiving means, for selecting a first edge of said first virtual object and for selecting a second edge of said second virtual object; and

grouping means, coupled to the receiving means and the selecting means, for grouping [descriptions of the pictorial representation of] said first and second virtual objects in the virtual world into a grouped object comprising said first and second virtual objects joined at an intersection of the first and second edges, the grouped object represented by [selected groups of] at least one of a three-dimensional and rotatable wireframe [objects] object and a three-dimensional and rotatable sweep polygon [objects].

On p. 8 of this second amendment, Applicants argued:

> Wexelblat does not teach or suggest grouping three-dimensional and rotatable wireframe objects or sweep polygons. In fact, the Official Action has not pointed out any support for three-dimensional objects in Wexelblat at all. As shown in the figures of Wexelblat, all parts of the icons of the system are two-dimensional, as would be expected since the "icons… are connected so that they respond directly to either an information system condition or a variable within a simulation algorithm."

On page 10 of the second amendment, Applicants argued:

> Although the Official Action correctly cites that Wexelblat discloses using shapes and combinations of shapes, these are two-dimensional as shown in Figures 1-6 of Wexelblat. Further, there is no teaching or suggestion of using three-dimensional wireframe objects or sweep polygons in Wexelblat because Wexelblat seeks to provide a representation of a scalar value.

On pp. 10-12 of the second amendment, Applicants also repeated the argument from the first amendment that Wexelblat concerns representations of views of information ("database views") as opposed to virtual objects.

Thus, the prosecution history of the original application reveals that the focus of Applicants' amendments and arguments was to distinguish from the cited art in terms of receiving and grouping representations of virtual objects as opposed to representations of information in a database, and grouping the representations of virtual objects into a group represented by a three-dimensional object. Appellants note that all of the independent

claims in the present reissue application include these features. Thus, Appellants assert that the reissue application claims do not seek to recapture surrendered subject matter.

When performing the first step of the three-step process of applying the recapture rule, the reissue application claims are compared to the patent claims to determining what aspects of the claims have been broadened. *Pannu*; *Clement*, 45 USPQ2d at 1164. However, when performing the second step in applying the recapture rule to determine if surrendered subject matter is now being claimed, the reissue application claims are compared to the surrendered claims (i.e. the claims prior to cancellation or amendment during the original prosecution). *Hester Indus., Inc. v. Stein, Inc.*, 46 USPQ2d 1641, 1649 (Fed. Cir. 1998); *Clement*, 45 USPQ2d at 1164-65; *Ball*, 221 USPQ at 295-96; *In re Richman*, 161 USPQ 359, 362-63 (C.C.P.A. 1969) ("The question raised to whether the appealed claims are of the same scope as the cancelled claims, not whether they lack some specific recitation absent from the cancelled claims but included in the patent claims."). Here, the surrendered claims are represented by claim 1 prior to the amendment of April 1, 1996, which read as follows:

> 1. An apparatus for creating a virtual world data base, comprising:
> receiving means for receiving a pictorial representation of objects in the virtual world; and
> grouping means, coupled to the receiving means, for grouping descriptions of the pictorial representation of objects in the virtual world into selected groups of at least one of wireframe objects and polygon objects.

Appellants are clearly not attempting to recapture this surrendered claim. All of the independent claims of the present reissue application are materially narrower than the surrendered claim 1, and the aspects by which they are broader than the surrendered claim are not material. "[I]f the reissue claim is narrower in an aspect germane to the prior art rejection, and broader in an aspect unrelated to the rejection, the recapture rule does not bar the claim." *Clement*, 45 USPQ2d at 1165. *See also*, *Ball*, 221 USPQ 289; *In re Wadlinger*, 181 USPQ 826 (C.C.P.A. 1974); *Richman*, 161 USPQ 359; *In re Willingham*, 127 USPQ 211 (C.C.P.A. 1960).

The present reissue claims do <u>not</u> present a typical recapture scenario, such as in *Clement* or *Mentor*, where the reissue claims seek to revert back to the language of the surrendered claim without otherwise materially narrowing the claim. Instead, the present reissue claims present a situation similar to the reissue claims is *Ball*, *Wadlinger*, *Richman* and *Willingham* where the reissue claims were materially more narrow than the <u>surrendered</u> claim and thus held to not be subject to the recapture rule. For example, all of the independent claims in the present reissue application include the material limitation that virtual objects are grouped into a three-dimensional grouped object. This "three-dimensional" group limitation is the limitation that was argued by Applicants in the second amendment of April 1, 1996 after which the application was allowed. Thus, all of the reissue application claims are clearly more narrow than the surrendered claims in this material aspect.

The aspects by which the reissue application claims are broader than the surrendered claims are not material to the rejection in the original application. For example, some of the reissue application claims are broader than the surrendered claims in that they are presented in a method format or computer-readable medium format as opposed to an apparatus format. However, a change in claim format is not considered to be a material difference. M.P.E.P. § 1412.02. Also, independent claims 10 and 58 do not recite the limitation "of at least one of wireframe objects and polygon objects" found in the surrendered claims. However, this limitation was not material to overcoming the rejection since the Examiner found this limitation to be present in the prior art. On p. 5 of the Final Action of December 31, 1995, the Examiner referred to "Wexelblat's specific mention of using polygon shapes in depicting the virtual world (col. 12, lines 21-25)" and "<u>Fisher</u> makes it clear that applicants' use of wireframe objects and polygon objects to depict objects in the virtual world is merely the well-known, prior art methodology for depicting objects in a virtual world (Fig. 9)." Therefore, it is clear that this limitation was not material in overcoming the prior art. Instead, it was the "three-dimensional" group limitation that was added after the final rejection that secured allowance of the claims. The "three-dimensional" group limitation is present in all of the reissue application

claims. Therefore, the reissue application claims fall in the "(3)(b)" category stated in *Clement* where "if the reissue claim is narrower [than the surrendered claims] in an aspect germane to the prior art rejection, and broader in an aspect unrelated to the rejection, the recapture rule does not bar the claim." *Id.* at 1165.

Even if the limitation "of at least one of wireframe objects and polygon objects" found in the surrendered claims is considered to be material, the absence of this limitation in claims 10 and 58 does not invoke the recapture rule because claims 10 and 58 have been materially narrowed by inclusion of the "three-dimensional" group material limitation. "Reissue claims that are broader in certain aspects and narrower in others may avoid the effect of the recapture rule." *Mentor*, 27 USPQ2d at 1525. For example, in *Ball* the reissue claims omitted the specific limitation that had originally been added to the claim at the Examiner's suggestion to obtain allowance. *Id.* at 291-93. However, the reissue claims were narrowed in another material aspect such that the Federal Circuit held that the recapture rule did not apply even though the very limitation used to obtain allowance in the original application had been removed from the reissue claims. *Id.* at 295-96. As Judge Rich stated in *Richman*: "Certainly one might err without deceptive intention in adding a particular limitation where a less specific limitation regarding the same feature, or an added limitation relative to another element, would have been sufficient to render the claims patentable over the prior art." *Id.* at 363. Moreover, Appellants note that the "of at least one of wireframe objects and polygon objects" limitation is found in the other independent claims of the present reissue application and in certain dependent claims to claims 10 and 58, all of which should be analyzed separately for application of the recapture rule.

The reissue claims have also been broadened from the <u>patent</u> claims by differing in how the "selecting means" is recited in some of the reissue application claims. The "selecting means" was added in the second amendment during the original prosecution to provide better context for the "grouping means" limitation. No aspect of the "selecting means" was argued to distinguish from the prior art. Since Applicants made no

admission that any aspect of the "selecting means" was required to overcome the rejection, the recapture rule does not apply. *Seattle Box*, 221 USPQ at 574. Moreover, all of the independent claims of the reissue application include a "selecting" limitation. In contrast, the surrendered claim 1 of the original application did not include any "selecting" limitation at all. Thus, even if the "selecting means" limitation were considered material, the recapture rule would still not apply because the reissue application claims are narrower than the surrendered claim in this aspect. *Clement*, 45 USPQ2d at 1165; *Richman*, 161 USPQ at 363-64. Additionally, some of the present claims do include a "selecting" limitation very similar to the "selecting means" of the patent claims. Thus, each of the present claims should be analyzed separately. Finally, the reissue application claims are materially narrower in another aspect to avoid the recapture rule, e.g. by inclusion of the "three-dimensional" group limitation. *Pannu*; *Hester*, 46 USPQ2d at 1649; *Ball*, 221 USPQ at 295-96.

The reissue claims have also been broadened from the patent claims by differing in how the "grouping means" is recited in that the language "joined at an intersection of the first and second edges" is not included in some of the reissue application claims. However, this language was not relied upon to distinguish from the prior art. Since Applicants made no admission that "joined at an intersection of the first and second edges" was required to overcome the rejection, the recapture rule does not apply. *Seattle Box*, 221 USPQ at 574. Also, the surrendered claim 1 of the original application did not include the "joined at an intersection of the first and second edges" language. Even if the "joined at an intersection of the first and second edges" language from the "grouping means" limitation were considered material, the recapture rule would still not apply because the reissue application claims are materially narrower than the surrendered claim in regard to the "grouping" claim element by inclusion of the "three-dimensional" group limitation. *Clement*, 45 USPQ2d at 1165; *Ball*, 221 USPQ at 295-96; *Richman*, 161 USPQ at 363-64. Additionally, some of the present claims do include language very similar to the "joined at an intersection of the first and second edges" language of the patent claims. Thus, each of the present claims should be analyzed separately.

In summary, the Examiner appears to have primarily erred by comparing the reissue application claims to the patent claims in determining whether surrendered subject matter is being recaptured. *See* November 21, 2000 Office Action, pp. 2-3. As noted above, the reissue claims are properly compared to the patent claims to determine what aspects have been broadened, but when determining whether the broadened aspects seek to recapture surrendered subject matter, the reissue claims are compared to the surrendered claims (i.e. the claims prior to cancellation or amendment during the original prosecution), not the patent claims. As discussed above, when properly compared to the surrendered claims, it is clear the reissue claims do not seek to recapture surrendered subject matter and are materially narrower than the surrendered claims. The Examiner also erred in not providing any analysis of whether the reissue application claims were materially narrowed in other respects to avoid the recapture rule (step three of the *Pannu* recapture rule test; see also *Ball* et al.). The Examiner further erred in not providing a separate analysis of the recapture rule for each individual claim, including the dependent claims.

Finally, Appellants note that the Examiner's assertion on p. 3 of the November 21, 2000 Office Action that the use of a term such as "CPU" as opposed to the original means-plus-function claim language, is recapture. Claiming the invention in terms other than means-plus-function is not recapture because during the original prosecution Applicants did not rely on the means-plus-function format of the claims to obtain allowance. Thus, claim formats other than means-plus-function were not surrendered. Recapture only applies if there is clear evidence of surrender through admission that the scope of the surrendered claims was not in fact patentable. *Seattle Box*, 221 USPQ at 574. "In other words, a general 'boiler plate' sentence [that the limitations of a claim distinguish from the prior art] will not be sufficient to establish recapture." M.P.E.P. § 1412.02. Applicants never relied on the means-plus-function nature of the claims to distinguish from the prior art during the original prosecution.

IX. CONCLUSION

For the foregoing reasons, it is submitted that the Examiner's rejection of claims 1-46, 48-94 and 97-108 was erroneous, and reversal of the Examiner's decision is respectfully requested.

This Appeal Brief is submitted in triplicate along with the following items:

☒ Return Receipt Postcard

☒ Petition for a One Month Extension of Time

☒ Deposit Account Fee Authorization form for the $320.00 appeal brief fee and $110.00 extension of time fee.

Respectfully submitted,

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X. APPENDIX

The claims on appeal are as follows.

1. An apparatus for creating a virtual world data base, comprising:

receiving means for receiving first, second and third polygon representations of respective first, second and third virtual objects in a virtual world;

selecting means, coupled to said receiving means, for selecting a first edge of said first virtual object and for selecting a second edge of said second virtual object; and

grouping means, coupled to the receiving means and the selecting means, for grouping said first and second virtual objects in the virtual world into a grouped object comprising said first and second virtual objects joined at an intersection of the first and second edges, the grouped object represented by at least one of a three-dimensional and rotatable wireframe object and a three-dimensional and rotatable sweep polygon.

2. The apparatus according to claim 1 further comprising attribute assigning means, coupled to the grouping means, for assigning an attribute to the first and second edges of the first and second virtual objects, the attribute means including hierarchy means for assigning a grouping hierarchy for the first and second virtual objects wherein the second virtual object is assigned as a child object of the first virtual object and wherein an orientation and a position of the child object is calculated relative to the first virtual object.

3. The apparatus according to claim 2 wherein the attribute assigning means further comprises:

origin assigning means for assigning an origin on the first virtual object around which the third virtual object can rotate; and

constraint assigning means for assigning a three-dimensional constraint of motion to the third virtual object to constrain how the third virtual object can rotate with respect to the first virtual object.

4. The apparatus of claim 3, wherein the constraint assigning means comprises means for specifying a minimum angle and a maximum angle that said third virtual object can rotate with respect to said origin.

5. The apparatus according to claim 3 wherein the attribute assigning means further comprises color assigning means for assigning color values to the grouped object.

6. The apparatus according to claim 5 wherein the attribute assigning means further comprises texture assigning means for assigning texture values to the grouped object.

7. The apparatus according to claim 2 further comprising data coupling means, coupled to the grouping means, for coupling real world data to the grouped object.

8. An apparatus for creating a virtual world comprising:

receiving means for receiving first, second and third polygon representations of respective first, second and third virtual objects in a virtual world;

selecting means, coupled to said receiving means, for selecting a first edge of a first virtual object and for selecting a second edge of a second virtual object; and

grouping means, coupled to the receiving means and the selecting means, for grouping said first and second virtual objects in the virtual world into a grouped object comprising said first and second virtual objects joined at an intersection of the first and second edges, the grouped object represented by at least one of a three-dimensional and rotatable wireframe object and a three-dimensional and rotatable sweep polygon;

attribute assigning means, coupled to the grouping means, for assigning an attribute to the first and second edges of the first and second virtual objects, the attribute assigning means including:

hierarchy means for assigning a grouping hierarchy for the first and second virtual objects wherein the second virtual object is assigned as a child object of the first virtual object and an orientation and position of the child object is calculated relative to the first virtual object; and

origin assigning means for assigning an origin on the first virtual object around which the third virtual object can rotate; and

constraint assigning means for assigning a three-dimensional constraint of motion to the third virtual object to constrain how the third virtual object can rotate with respect to the first virtual object; and

rendering means for rendering the virtual world including the grouped object.

9. The apparatus of claim 8, wherein the constraint assigning means comprises means for specifying a minimum angle and a maximum angle that said third virtual object can rotate with respect to said origin.

10. A method for creating a data base representing a virtual world, the method comprising:

receiving a plurality of polygon representations of virtual objects;

selecting first and second virtual objects from said plurality of polygon representations of virtual objects;

grouping the first and second virtual objects into a three-dimensional grouped object;

assigning a grouping hierarchy for the first and second virtual objects, wherein the second virtual object is assigned as the child of the first virtual object; and

calculating an orientation and position of the child object relative to the first virtual object.

11. The method of claim 10, wherein said grouping includes representing the grouped object by at least one of the following:

a three-dimensional and rotatable wireframe object, and

a three-dimensional and rotatable polygon object.

12. The method as recited in claim 10, further comprising:

assigning an origin on the first virtual object around which the second virtual object can rotate; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the first virtual object.

13. The method as recited in claim 10, further comprising:

assigning an origin to the first virtual object, wherein said origin has a fixed position relative to said first virtual object; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the origin.

14. The method as recited in claim 13, wherein the origin is within the first object.

15. The method as recited in claim 13, wherein the origin is on the surface of the first object.

16. The method as recited in claim 13, wherein the origin is a predetermined distance from the surface of the first object.

17. The method as recited in claim 13, wherein the second virtual object has one degree of freedom relative to said origin.

18. The method as recited in claim 13, wherein the second virtual object has at least two degrees of freedom relative to said origin.

19. The method as recited in claim 10, further comprising:

assigning an axis to the first virtual object, wherein said axis has a fixed position relative to said first virtual object; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the axis.

20. The method as recited in claim 19, wherein the axis is a line.

21. The method as recited in claim 19, wherein the axis is a line segment.

22. The method as recited in claim 19, wherein the axis is at least partially within the first object.

23. The method as recited in claim 19, wherein the axis is at least partially on the surface of the first object.

24. The method as recited in claim 19, wherein the axis does not intersect the first object.

25. The method as recited in claim 13, wherein the second virtual object has one degree of freedom relative to said axis.

26. The method as recited in claim 13, wherein the second virtual object has at least two degrees of freedom relative to said axis.

27. The method as recited in claim 10, further comprising:

defining a locus of points having a fixed position relative to said first virtual object and said origin; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the locus of points.

28. The method as recited in claim 12, further comprising specifying a minimum angle and a maximum angle that the second virtual object can rotate with respect to the origin.

29. The method as recited in claim 12, further comprising specifying one or more angles as constraints on the rotation of the second object relative to said origin.

30. The method as recited in claim 12, further comprising specifying one or more constraints on the translation of the second object relative to said origin.

31. The method as recited in claim 10, further comprising:

receiving a third virtual object;

assigning an origin on the first virtual object around which the third virtual object can rotate; and

assigning a three-dimensional constraint of motion to the third virtual object that constrains how the third virtual object can rotate with respect to the first virtual object.

32. The method as recited in claim 10, further comprising:

receiving a third virtual object; and

grouping said third object into the three-dimensional grouped object.

33. The method as recited in claim 32, wherein the third virtual object is assigned as the child of the first virtual object; and wherein the orientation and position of the third virtual object is calculated relative to the first virtual object.

34. The method as recited in claim 32, wherein the third virtual object is assigned as the child of the second virtual object; and wherein the third virtual object inherits the constraints assigned to the second virtual object.

35. The method as recited in claim 34, further comprising calculating the third virtual object's orientation and position relative to the first virtual object.

36. The method as recited in claim 35, further comprising calculating the third virtual object's orientation and position relative to the second virtual object.

37. The method as recited in claim 31, further comprising specifying a minimum angle and a maximum angle that the third virtual object can rotate with respect to the origin.

38. The method as recited in claim 10, further comprising:

grouping a fourth virtual object and a fifth virtual object to create a second grouped object; and

grouping the second grouped object with first grouped object; and

assigning a grouping hierarchy for the fourth and fifth virtual objects, wherein the fourth and fifth virtual objects are assigned as the child of the second virtual object.

39. The method as recited in claim 10, further comprising assigning color values to the grouped object, wherein each virtual object that is part of said grouped object inherits the assigned color.

40. The method as recited in claim 10, further comprising assigning a color value to a particular virtual object within the grouped object, wherein each virtual object that is a child of the particular virtual object inherits the assigned color.

41. The method as recited in claim 10, further comprising assigning texture values to the grouped object.

42. The method as recited in claim 10, further comprising coupling real world data to the grouped object.

43. The method as recited in claim 10, wherein the real world data comprises positional and rotational information.

44. The method as recited in claim 10, wherein said grouping the first and second virtual objects includes:

selecting a first edge of said first virtual object;

selecting a second edge of said second virtual object;

wherein said three-dimensional grouped object comprises said first and second virtual objects joined with at least a portion of said first edge of said first virtual object contacting at least a portion of said second edge of said second virtual object.

45. The method as recited in claim 10, wherein said grouping the first and second virtual objects includes:

selecting a first edge of said first virtual object;

selecting a second edge of said second virtual object;

wherein said three-dimensional grouped object comprises said first and second virtual objects joined at an intersection of the first and second edges.

46. A memory medium comprising program instructions for creating a data base representing a virtual world, wherein the program instructions are executable to implement:

receiving a plurality of polygon representations of a plurality of virtual objects including a first virtual object, a second virtual object, and a third virtual object;

selecting the first and second virtual objects from said plurality of polygon representations of virtual objects using edges of the virtual objects;

grouping the first and second virtual objects into a three-dimensional grouped object represented by at least one of the following:

a three-dimensional and rotatable wireframe object, and

a three-dimensional and rotatable polygon object;

assigning a grouping hierarchy for the first and second virtual objects, wherein the second virtual object is assigned as the child of the first virtual object; and

calculating an orientation and position of the child object relative to the first virtual object.

48. The memory medium as recited in claim 46, wherein the program instructions are further executable to implement:

assigning an origin to the first virtual object; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can translate and rotate with respect to the first virtual object.

49. The memory medium as recited in claim 48, wherein the program instructions are further executable to implement:

specifying one or more angles that constrain the second virtual object's rotation with respect to the origin.

50. The memory medium as recited in claim 48, wherein the program instructions are further executable to implement:

specifying one or more angles relative to the origin that constrain the second virtual object's freedom to move relative to the origin.

51. The memory medium as recited in claim 48, wherein the program instructions are further executable to implement:

receiving a third virtual object; and

grouping the third object into the grouped object as a child of the second object, wherein the third object inherits the second object's constraints relative the to origin.

52. The memory medium as recited in claim 51, wherein the program instructions are further executable to implement:

receiving a third virtual object;

grouping the third object into the grouped object; and

specifying constraint angles that the third virtual object can rotate with respect to the origin.

53. The memory medium as recited in claim 46, wherein the program instructions are further executable to implement assigning color values to the grouped object, wherein each virtual object in the grouped object inherits the color values

54. The memory medium as recited in claim 46, wherein the program instructions are further executable to implement assigning texture values to the grouped object, wherein each virtual object in the grouped object inherits the texture values

55. The memory medium as recited in claim 46, wherein the program instructions are further executable to implement coupling real world data to the grouped object.

56. The memory medium as recited in claim 46, wherein said grouping the first and second virtual objects includes:

selecting a first edge of said first virtual object;

selecting a second edge of said second virtual object;

wherein said three-dimensional grouped object comprises said first and second virtual objects joined with at least a portion of said first edge of said first virtual object contacting at least a portion of said second edge of said second virtual object.

57. The memory medium as recited in claim 46, wherein said grouping the first and second virtual objects includes:

selecting a first edge of said first virtual object;

selecting a second edge of said second virtual object;

wherein said three-dimensional grouped object comprises said first and second virtual objects joined at an intersection of the first and second edges.

58. A system for creating a data base representing a virtual world, the system comprising:

a computer system comprising a CPU and memory, wherein the memory stores a plurality of polygon representations of virtual objects;

a user input device coupled to the computer system for providing user input to the computer system;

wherein the CPU is operable to select first and second virtual objects from said plurality of polygon representations of virtual objects;

wherein the CPU is operable to group the first and second virtual objects into a three-dimensional grouped object;

wherein the CPU is operable to assign a grouping hierarchy for the first and second virtual objects, wherein the second virtual object is assigned as the child of the first virtual object; and

wherein the CPU is operable to calculate an orientation and position of the child object relative to the first virtual object.

59. The system as recited in claim 58, wherein the CPU is operable to represent the grouped object as at least one of the following:

a three-dimensional and rotatable wireframe object, and

a three-dimensional and rotatable polygon object.

60. The system as recited in claim 58, wherein the CPU is operable to:

assign an origin on the first virtual object around which the second virtual object can rotate, and

assign a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the first virtual object.

61. The system as recited in claim 60, wherein the CPU is configured to receive constraint data from the user input device specifying a minimum angle and a maximum angle that the second virtual object can rotate with respect to the origin, wherein the CPU is configured to constrain the motion of the second virtual object with respect to the origin in response to receiving said constraint data.

62. The system as recited in claim 58, wherein the CPU is operable to:

assign an origin on the first virtual object around which a third virtual object can rotate, and

assign a three-dimensional constraint of motion to the third virtual object that constrains how the second virtual object can rotate with respect to the first virtual object.

63. The system as recited in claim 62, wherein the CPU is configured to receive constraint data from the user input device specifying a minimum angle and a maximum angle that the third virtual object can rotate with respect to the origin, wherein the CPU is configured to constrain the motion of the third virtual object with respect to the origin in response to receiving said constraint data.

64. The system as recited in claim 58, wherein the CPU is further configured to assign color values to the grouped object.

65. The system as recited in claim 58, wherein the CPU is further configured to assign texture values to the grouped object.

66. The system as recited in claim 58, wherein the CPU is further configured to couple real world data to the grouped object.

67. The system as recited in claim 58, wherein the CPU is further configured to:

select a first edge of said first virtual object, and

select a second edge of said second virtual,

wherein said three-dimensional grouped object comprises said first and second virtual objects joined with at least a portion of said first edge of said first virtual object contacting at least a portion of said second edge of said second virtual object.

68. The system as recited in claim 58, wherein said CPU is configured to group the first and second virtual objects by:

selecting a first edge of said first virtual object, and

selecting a second edge of said second virtual object,

wherein said three-dimensional grouped object comprises said first and second virtual objects joined at an intersection of the first and second edges.

69. A method for creating a data base representing a virtual world, the method comprising:

receiving a plurality of polygon representations of virtual objects, wherein the plurality of polygon representations include a first, a second, and a third representation of respective first, second, and third virtual objects, wherein the virtual objects have edges;

selecting first and second virtual objects using the edges from said plurality of polygon representations of virtual objects;

grouping the first and second virtual objects into a grouped object comprising a combination of the first and second virtual objects, wherein the first and second virtual objects intersect; and

representing the grouped object by at least one of the following:

a three-dimensional and rotatable wireframe object, and

a three-dimensional and rotatable sweep polygon object.

70. The method as recited in claim 69, further comprising:

assigning a grouping hierarchy for the first and second virtual objects, wherein the second virtual object is assigned as the child of the first virtual object; and

calculating an orientation and position of the child object relative to the first virtual object.

71. The method as recited in claim 70, further comprising:

assigning group attributes to the grouped object; and

assigning individual attributes to a particular virtual object within the grouped object, wherein the individual attributes are inherited by child objects of the particular virtual object.

72. The method as recited in claim 70, further comprising:

assigning an origin on the first virtual object around which the second virtual object can rotate; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the first virtual object.

73. The method as recited in claim 72, further comprising specifying one or more angles that constrain the second virtual object's rotation with respect to the origin.

74. The method as recited in claim 72, further comprising specifying one or more constraint values that constrain the second virtual object's translation with respect to the origin.

75. The method as recited in claim 74, further comprising:

grouping a third virtual object into the grouped object; and

assigning a three-dimensional constraint of motion to the third virtual object that constrains how the third virtual object can rotate with respect to the origin.

76. The method as recited in claim 75, further comprising specifying one or more constraint angles that constrain the third virtual object's rotation with respect to the origin.

77. The method as recited in claim 70, further comprising assigning texture and color values to the grouped object.

78. The method as recited in claim 70, further comprising coupling real world data to the grouped object.

79. The method as recited in claim 78, wherein said coupling comprises:

taking sensor data from real world inputs; and

varying the orientation of the child object with respect to the origin in relation to the sensor data.

80. The method as recited in claim 78, wherein said coupling comprises:

taking sensor data from real world inputs; and

varying the position of the child object with respect to the origin in relation to the sensor data.

81. The method as recited in claim 78, wherein said coupling comprises:

sensing the relative position of two real world physical objects; and

adjusting the relative position of the second virtual object relative to the origin accordingly.

82. The method as recited in claim 78, wherein said coupling comprises:

sensing the relative orientation of two real world physical objects; and

adjusting the relative orientation of the second virtual object relative to the origin accordingly.

83. The method as recited in claim 82, wherein said sensing is accomplished using a data glove.

84. A computer program for creating a virtual world data base, wherein said computer program is embodied on computer-readable media and comprises instructions configured to:

read polygon representations of a plurality of virtual objects, including a first virtual object, a second virtual object, and a third virtual object;

select the first virtual object and the second virtual object from said plurality of virtual objects;

assign attributes to the first and second virtual objects;

group said first and second virtual objects into a grouped object, wherein said first and second virtual objects intersect;

represent the grouped object by at least one of the following:

a three-dimensional and rotatable wireframe object, and

a three-dimensional and rotatable polygon object;

assign a grouping hierarchy to the first and second virtual objects, wherein the second virtual object is assigned as the child of the first virtual object; and

calculate an orientation and position of the child object relative to the first virtual object.

85. The computer program as recited in claim 84, wherein said computer program further comprises instructions configured to:

assign an origin on the first virtual object around which the second virtual object can rotate; and

assign a three-dimensional constraint of motion to the second virtual object, wherein said three-dimensional constraint of motion constrains how the second virtual object can rotate with respect to the first virtual object.

86. The computer program as recited in claim 84, wherein said computer program further comprises instructions configured to specify a minimum angle and a maximum angle that the third virtual object can rotate with respect to the origin.

87. The computer program as recited in claim 84, wherein said computer program further comprises instructions configured to assign color values to the grouped object.

88. The computer program as recited in claim 84, wherein said computer program further comprises instructions configured to assign texture values to the grouped object.

89. The computer program as recited in claim 84, wherein said computer program further comprises instructions configured to couple real world data to the grouped object.

90. The computer program as recited in claim 89, wherein said computer program is configured to:

take sensor data from real world inputs; and

vary the orientation of the child object with respect to the origin in relation to the sensor data.

91. The computer program as recited in claim 89, wherein said computer program is configured to:

take sensor data from real world inputs; and

vary the position of the child object with respect to the origin in relation to the sensor data.

92. The computer program as recited in claim 89, wherein said computer program is configured to:

sense the relative position of two real world physical objects; and

adjust the relative position of the second virtual object relative to the origin accordingly.

93. The computer program as recited in claim 89, wherein said computer program is configured to:

sense the relative orientation of two real world physical objects; and

adjust the relative orientation of the second virtual object relative to the origin accordingly.

94. The computer program as recited in claim 93, wherein said computer program is configured to sense the relative orientation of two real world objects from input signals received from a data glove.

97. An apparatus for creating a virtual world data base, comprising:

a receiving means for receiving first and second polygon representations of respective first and second virtual objects in a virtual world;

a selecting means coupled to said receiving means and configured to select said first and second virtual objects by selecting one edge from each of said first and second virtual objects;

a grouping means coupled to said receiving means and selecting means, wherein said grouping means is configured to group said first and second virtual objects into a grouped object, wherein the grouped object is represented by at least one of a three-dimensional and rotatable wireframe object and a three dimensional and rotatable polygon object; and

an attribute assigning means coupled to said grouping means, wherein said assigning means is configured to assign an attribute to the first and second virtual objects, wherein the attribute assigning means comprises a hierarchy means for assigning a grouping hierarchy to the first and second virtual objects, wherein the second virtual object is assigned as a child object of the first virtual object, and wherein an orientation and a position of the child object is calculated relative to the first virtual object, wherein said attribute assigning means further comprises:

an origin assigning means for assigning an origin on the first virtual object around which a third virtual object can rotate, wherein said third virtual object is selected by said selecting means from said plurality of virtual objects; and

a constraint assigning means for assigning a three-dimensional constraint of motion to the third virtual object to constrain how the third virtual object can rotate with respect to the first virtual object.

98. The apparatus as recited in claim 97, wherein the constraint assigning means is further configured to specify a minimum angle and a maximum angle that said third virtual object can rotate with respect to said origin.

99. The apparatus as recited in claim 97, further comprising an color assigning means coupled to the attribute assigning means, wherein said color assigning means is configured to assign color values to the grouped objects.

100. The apparatus as recited in claim 97, further comprising a texture assigning means coupled to the attribute assigning means, wherein the texture assigning means is configured to assign texture values to the grouped objects.

101. The apparatus as recited in claim 97, further comprising a data coupling means coupled to the attribute assigning means, wherein the data coupling means is configured to couple real world data to the grouped objects.

102. A computer program embodied on a computer-readable medium, wherein the computer program is configured to create a data base representing a virtual world by:

receiving a plurality of polygon representations of virtual objects;

selecting first and second virtual objects from said plurality of polygon representations of virtual objects;

grouping the first and second virtual objects into a hierarchical grouped object, wherein said grouping includes:

selecting a first mathematical edge of said first virtual object;

selecting a second mathematical edge of said second virtual object; and

representing the grouped object by at least one of the following:

a three-dimensional and rotatable hierarchical wireframe object, and

a three-dimensional and rotatable hierarchical polygon object.

103. The medium of claim 102, wherein said first and second mathematical edges are single points.

104. The medium of claim 102, wherein said first and second mathematical edges are detached from said first and second virtual objects.

105. The medium of claim 102, wherein the first and second virtual objects intersect, and wherein the grouped object comprises said first and second virtual objects joined with at least a portion of said first edge of said first virtual object contacting at least a portion of said second edge of said second virtual object.

106. The medium of claim 102, further comprising:

assigning a grouping hierarchy for the first and second virtual objects, wherein the second virtual object is assigned as the child of the first virtual object; and

calculating an orientation and position of the child object relative to the first virtual object.

assigning an origin on the first virtual object around which the second virtual object can rotate; and

assigning a three-dimensional constraint of motion to the second virtual object that constrains how the second virtual object can rotate with respect to the first virtual object.

107. The medium of claim 102, further comprising specifying a minimum angle and a maximum angle that the second virtual object can rotate with respect to the origin.

108. The medium of claim 102, further comprising assigning an attributes to the grouped object, wherein the attribute is texture, color, normal direction, maximum rotation angle, or minimum rotation angle.